Please provide the following information, and submit to the NOAA DM Plan Repository.

Reference to Master DM Plan (if applicable)

As stated in Section IV, Requirement 1.3, DM Plans may be hierarchical. If this DM Plan inherits provisions from a higher-level DM Plan already submitted to the Repository, then this more-specific Plan only needs to provide information that differs from what was provided in the Master DM Plan.

URL of higher-level DM Plan (if any) as submitted to DM Plan Repository:

1. General Description of Data to be Managed

1.1. Name of the Data, data collection Project, or data-producing Program:

Identifying coral reef resilience potential in Tutuila, American Samoa based on NOAA coral reef monitoring data from 2010 to 2016

1.2. Summary description of the data:

Declines in the health of coral reef ecosystems lead scientists to search for factors that support reef resilience: the ability of reefs to resist environmental stress and recover when they have been impacted, and to maintain key ecosystem functions throughout. Scientists have identified eleven measurable factors that affect the resilience of coral reefs. Reef resilience factors include characteristics of the coral assemblage, populations of fish that live on the reef, land-based influences, and sea surface temperature variability. NOAA Pacific Islands Fisheries Science Center (PIFSC) Ecosystem Sciences Division (ESD) used these factors to quantitatively assess the resilience potential of reefs around Tutuila and Aunuʻu Islands in American Samoa.

Locations of monitoring surveys conducted by ESD from 2010 to 2016 were used to designate study zones. The monitoring surveys provided data to evaluate biological/ ecological resilience factors, and external data sources were used to inform physical and environmental factors not directly measured by ESD. Data for each metric was compiled, normalized, and averaged to produce a composite resilience score for each of zone. The primary resilience analysis includes all 11 metrics for 10 study zones around Tutuila and Aunu'u, excluding Taema Bank. The secondary resilience analysis includes the 8 metrics available for 11 study zones around Tutuila and Aunu'u, including Taema Bank.

The information provided with this analysis includes the individual datasets for the 11 metrics used in the analysis (data tables), the survey sites and study zones (data tables), and the resilience scores resulting from the analysis (data tables and maps).

1.3. Is this a one-time data collection, or an ongoing series of measurements?

One-time data collection

1.4. Actual or planned temporal coverage of the data:

1985 to 2012, 2010-02-17 to 2016-04-30, 1917 to 2017

1.5. Actual or planned geographic coverage of the data:
W: -170.92, E: -170.431, N: -14.15, S: -14.45
Islands of Tutuila and Aunu'u, American Samoa

1.6. Type(s) of data:
(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)
tabular digital data, and digital map

1.7. Data collection method(s):
(e.g., satellite, airplane, unmanned aerial system, radar, weather station, moored buoy, research vessel, autonomous underwater vehicle, animal tagging, manual surveys, enforcement activities, numerical model, etc.)
Instrument: Not applicable
Platform: Not applicable
Physical Collection / Fishing Gear: Not applicable

1.8. If data are from a NOAA Observing System of Record, indicate name of system:

1.8.1. If data are from another observing system, please specify:

2. Point of Contact for this Data Management Plan (author or maintainer)

2.1. Name:
Annette M DesRochers

2.2. Title:
Metadata Contact

2.3. Affiliation or facility:

2.4. E-mail address:
annette.desrochers@noaa.gov

2.5. Phone number:
(808)725-5461

3. Responsible Party for Data Management
Program Managers, or their designee, shall be responsible for assuring the proper management of the data produced by their Program. Please indicate the responsible party below.

3.1. Name:
Brett D Schumacher

3.2. Title:
Data Steward

4. Resources

Programs must identify resources within their own budget for managing the data they produce.

4.1. Have resources for management of these data been identified?

Yes

4.2. Approximate percentage of the budget for these data devoted to data management (specify percentage or "unknown"):

Unknown

5. Data Lineage and Quality

NOAA has issued Information Quality Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information which it disseminates.

5.1. Processing workflow of the data from collection or acquisition to making it publicly accessible

(describe or provide URL of description):

Lineage Statement:

The principal analytical task of this project was to calculate eleven metrics of "reef resilience" as identified by McClanahan et al. (2012). These metrics account for various aspects of the coral reef ecosystem, and are derived from several data streams, as described in the process steps.

Process Steps:

- The first task was to identify and define zones of interest, hereafter known as study zones. Eleven study zones were delineated for the present project. Four of these zones reflect broad geographic regions (i.e. Northeast, Northwest, Southeast, Southwest) that have been used to organize ecological surveys conducted by the ESD under the National Coral Reef Monitoring Program based on broadly similar habitat and exposure to wave and weather conditions. Several smaller zones of interest were then identified that had been the subject of focused survey effort by the ESD during previous projects, providing geographically dense data to evaluate the resilience potential for each individual zone: Taema Bank had suffered severe impacts due to predation on corals by crown-of-thorns seastars; Aunuʻu East, Aunuʻ u West, Fagamalo, and Fagatele are marine protected areas (MPAs); and Fagaʻalu Bay and Vatia Bay were the subject of previous studies by ESD on impacts of land-based sources of pollution (LBSP) (Vargas-Ángel and Schumacher In Review). (Citation: Vargas-Ángel, Bernardo, and Brett D Schumacher. Baseline Surveys for Coral Reef Community Structure and Demographics in Vatia Bay and Fagaʻalu Bay, American Samoa. PIFSC Data Report, In Review)
- The basis of the pollution metric is a watershed health index based on analysis of the American Samoa Environmental Protection Agency (Tuitele 2016). We used ArcGIS to combine this information by merging watersheds associated with each georegion and calculating a weighted mean WHI by area. (Citation: Tuitele C, et al. American Samoa Watershed Management and Protection Program FY15 Annual

Report. American Samoa Environmental Protection Agency, 2016)
- The sedimentation metric is based on precipitation that falls on the watersheds associated with each georegion. A "precipitation index" was derived based on interpolated rainfall information from the NOAA National Weather Service (https://hdsc.nws.noaa.gov/hdsc/pfds/meta/na14_vol5_as_grid_metadata.xml). Rainfall was scaled by the coastline of each georegion.
- The herbivore biomass metric was derived from data from NOAA Ecosystem Sciences Division Rapid Ecological Assessment (REA) fish surveys. Mean herbivore biomass for each zone, as well as all subsequently described metrics based on data from REA surveys, were calculated based on a weighted average of reef area in three depth zones (0-6 meters, 6-18 meters, 18-30 meters). (Citation: Ayotte, P., K. McCoy, A. Heenan, I. Williams, and J. Zamzow. 2015. Coral reef ecosystem program standard operating procedures: data collection for rapid ecological assessment fish surveys. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96818-5007. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-15-07, 33p. doi:10.7289/V5SN06ZT)
- The macroalgal cover metric was derived from analysis of digital images of the benthos (photoquadrats) from NOAA Ecosystem Sciences Division Rapid Ecological Assessment (REA) fish and coral surveys. (Citation: Lozada-Misa P, Schumacher BD, Vargas-Angel B. 2017. Analysis of benthic survey images via CoralNet : a summary of standard operating procedures and guidelines. Pacific Islands Fisheries Science Center, PIFSC Administrative Report, H-17-02, 169 p. https://doi.org/10.7289/V5/AR-PIFSC-H-17-02.)
- Metrics for coral diversity, coral recruitment, physical impacts to coral, and disease prevalence were calculated from data gathered by NOAA Ecosystem Sciences Division Rapid Ecological Assessment (REA) benthic surveys.
- The bleaching resistance metric was calculated based on the percent corals of a given species found in georegions, scaled by their sensitivity to bleaching as determined by observations of corals during a bleaching event.
- The fishing pressure metric was derived from multiple data sources. The proximity of human population was the primary driver. Census data was used to estimate mean population within 10 kilometers of reef in each georegion. No-take marine protected areas were assumed to not have fishing activity. Commericial fishing trips to a region were also used to create an index that was averaged with human population. These were scaled by reef area and averaged.
- The Sea Surface Temperature (SST) variability metric was derived from Pathfinder v5.2 ~4 kilometer (1/24 degrees) daily SST data for the period 1985-2012, provided by the Group for High Resolution Sea Surface Temperature (GHRSST) and the U.S. National Oceanographic Data Center. The Pathfinder project was supported in part by a grant from the NOAA Climate Data Record (CDR) Program for satellites. Scott Heron created derived data sets based on these data under a NOAA Coral Reef Conservation Program (CRCP) grant (Heron-786), and these derived data sets were used as the basis of the SST variability metric. Based on discussions with Heron, the number of significant thermal events (defined as a period where a reef area

experienced 4 consecutive degree heating weeks) and the interannual variability (standard deviation) of the climactically warmest month were combined to calculate the SST variability metric. Additional information about thermal history products is available at the Coral Reef Watch website (http://coralreefwatch.noaa.gov/satellite/thermal_history/th_index.php). (Citation: Heron SF, et al. "Warming Trends and Bleaching Stress of the World's Coral Reefs 1985-2012." Scientific Reports 6 (2016): 38402.)

5.1.1. If data at different stages of the workflow, or products derived from these data, are subject to a separate data management plan, provide reference to other plan:

5.2. Quality control procedures employed (describe or provide URL of description):
With some datasets, two different individuals generated summary statistics that were verified against each other. In other cases, the analysis was run two different ways or two different times and results were cross-checked. "Sanity checks" were also performed to evaluate if the results make sense and are logical.

6. Data Documentation

The EDMC Data Documentation Procedural Directive requires that NOAA data be well documented, specifies the use of ISO 19115 and related standards for documentation of new data, and provides links to resources and tools for metadata creation and validation.

6.1. Does metadata comply with EDMC Data Documentation directive?
Yes

6.1.1. If metadata are non-existent or non-compliant, please explain:

6.2. Name of organization or facility providing metadata hosting:
NMFS Office of Science and Technology

6.2.1. If service is needed for metadata hosting, please indicate:

6.3. URL of metadata folder or data catalog, if known:
https://www.fisheries.noaa.gov/inport/item/50521

6.4. Process for producing and maintaining metadata
(describe or provide URL of description):
Metadata produced and maintained in accordance with the NOAA Data Documentation Procedural Directive: https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC_PD-Data_Documentation_v1.pdf

7. Data Access

NAO 212-15 states that access to environmental data may only be restricted when distribution is

explicitly limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information) or by security requirements. The EDMC Data Access Procedural Directive contains specific guidance, recommends the use of open-standard, interoperable, non-proprietary web services, provides information about resources and tools to enable data access, and includes a Waiver to be submitted to justify any approach other than full, unrestricted public access.

7.1. Do these data comply with the Data Access directive?

Yes

7.1.1. If the data are not to be made available to the public at all, or with limitations, has a Waiver (Appendix A of Data Access directive) been filed?

7.1.2. If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure:

7.2. Name of organization of facility providing data access:

National Centers for Environmental Information - Silver Spring, Maryland (NCEI-MD)

7.2.1. If data hosting service is needed, please indicate:

7.2.2. URL of data access service, if known:

http://accession.nodc.noaa.gov/0169632

7.3. Data access methods or services offered:

Data can be accessed online via the NOAA National Centers for Environmental Information (NCEI) Ocean Archive.

7.4. Approximate delay between data collection and dissemination:

Unknown

7.4.1. If delay is longer than latency of automated processing, indicate under what authority data access is delayed:

8. Data Preservation and Protection

The NOAA Procedure for Scientific Records Appraisal and Archive Approval describes how to identify, appraise and decide what scientific records are to be preserved in a NOAA archive.

8.1. Actual or planned long-term data archive location:

(Specify NCEI-MD, NCEI-CO, NCEI-NC, NCEI-MS, World Data Center (WDC) facility, Other, To Be Determined, Unable to Archive, or No Archiving Intended)

NCEI-MD

8.1.1. If World Data Center or Other, specify:

8.1.2. If To Be Determined, Unable to Archive or No Archiving Intended, explain:

8.2. Data storage facility prior to being sent to an archive facility (if any):
Pacific Islands Fisheries Science Center - Honolulu, HI

8.3. Approximate delay between data collection and submission to an archive facility:
Unknown

8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?
Discuss data back-up, disaster recovery/contingency planning, and off-site data storage relevant to the data collection
NOAA IRC and NOAA Fisheries ITS resources and assets.

9. Additional Line Office or Staff Office Questions
Line and Staff Offices may extend this template by inserting additional questions in this section.